Birzeit University

Faculty of Engineering and Technology

Civil Engineering Department

SURVEYING Lab ENCE316

Experiment no.8: Traverse measurement using Total station

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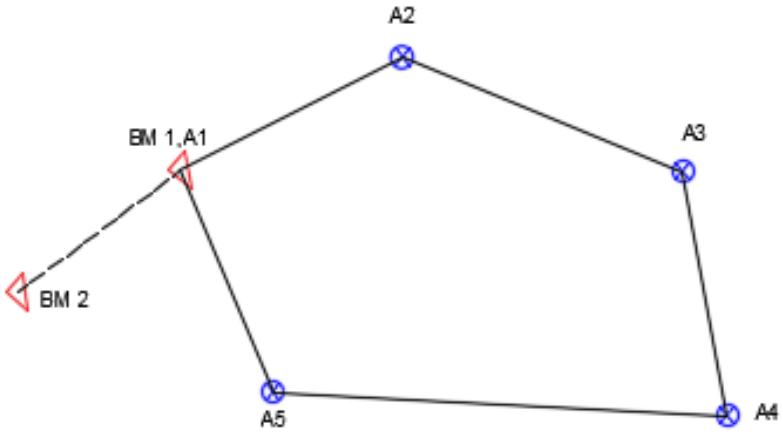


- Points A1, A2, A3, A4 and A5 are traverse points
- BM1 and BM2 are bench mark points

The aim of this experiment:

- Determine the coordinate of each traverse point (E, N)
- Determine the elevation of each traverse point (Z)

The following table must be filled in the field where,

HCR: Horizontal circle reading

Z.A: Zenith angle

SD: Slope distance

HD: Horizontal distance

VD: Vertical distance

HI: Height of instrument

RH: Reflector height

Station	Point	HCR	Z.A	SD	HD	VD	HI	RH
A1	BM2	0°0’ 0’’						
	A2	√						
A1	A2	0°0’ 0’’	√	√	√	√	√	√
	A5	√	√	√	√	√	√	√
A2	A3	0°0’ 0’’	√	√	√	√	√	√
	A1	√	√	√	√	√	√	√
A3	A4	0°0’ 0’’	√	√	√	√	√	√
	A2	√	√	√	√	√	√	√
A4	A5	0°0’ 0’’	√	√	√	√	√	√
	A3	√	√	√	√	√	√	√
A5	A1	0°0’ 0’’	√	√	√	√	√	√
	A4	√	√	√	√	√	√	√

Calculations:

Internal angle correction

- The sum of internal angle = 180 (n-2) , where n: # of traverse points
- Angular misclosure = $\sum$ internal angle - 180 (n-2)
- Ɛ allowable = c $\sqrt{n}$, c = 90 ″

  If Angular misclosure < Ɛ allowable then you error is accepted.
- You have to correct all of the internal angle using the following equation:

  Correction = $-\frac{Miscloser\ error}{n}$ (Note: all internal angle have the same correction)

  Corrected angle = observed angle + correction

Azimuth calculation

- $\alpha_{A1-BM2} = \tan^{-1} \frac{EBM2-EA1}{NBM2-NA1}$
- Find the azimuth for each traverse leg. (α_{A1-A2} , α_{A2-A3}, ……etc)

Horizontal distances

- The accepted difference between any two reading : $\Delta\ell = (0.0007\ \ell + 0.03)$

  Then find the average value for length of each traverse leg (Horizontal distances)

  For example, $\ell_{A1\ A2} - \ell_{A2\ A1} < \Delta\ell$

  $$\ell\ \overline{A1\ A2} = (\ell_{A1\ A2} + \ell_{A2\ A1})/2$$

Coordinates and their corrections

- $\Delta E = \ell_{avg} \sin\alpha$
- $\Delta N = \ell_{avg} \cos\alpha$

  Find the for all traverse leg: (ΔE_{12} , ΔN_{12}) , (ΔE_{23} , ΔN_{23}), (ΔE_{34} , ΔN_{34}),…..

- For Departure error ($\delta\ \Delta E$) = $\sum\Delta E$
- For Latitude error ($\delta\ \Delta N$) = $\sum\Delta N$
- $Total\ closing\ error\ \delta = \sqrt{(\sum\Delta E)^2 + (\sum\Delta N)^2}$
- δallowable = 0.0009 ($\sum \bar{L}$) + 0.2

- Dept. correction for traverse leg = - $\frac{Leg\ length}{Sum\ of\ length}$ * Total Dept. error
- Lat. correction for traverse leg = - $\frac{Leg\ length}{Sum\ of\ length}$ * Total Lat. error

  For example, ΔE_{12} correction = - $\frac{L12\ avg}{\sum L}$ * (δ ΔE)

  ΔN_{12} correction = - $\frac{L12\ avg}{\sum L}$ * (δ ΔN)

- Then find corrected coordinates

  For example, ΔE_{12} corrected= ΔE_{12} calculated+ΔE_{12} correction

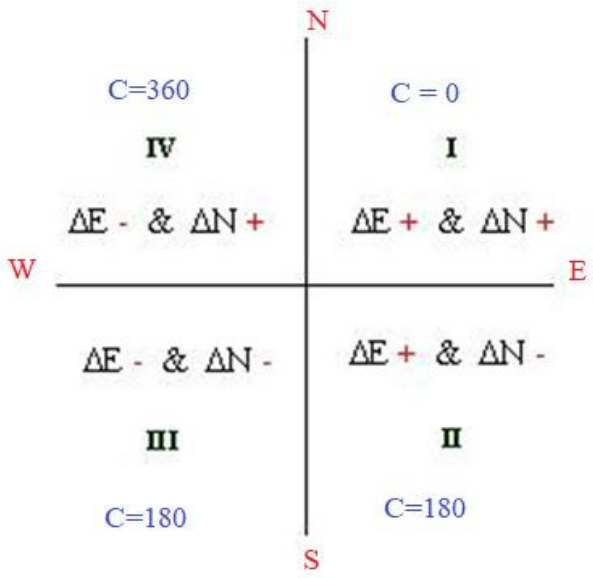
  ΔN_{12} corrected= ΔN_{12} calculated+ΔN_{12} correction

  $E_2=E_1+\Delta E_{12}$ corrected

  $N_2=N_1+\Delta N_{12}$ corrected

- Based on the corrected coordinates find the value of the azimuth of each traverse leg.

  α =$\tan^{-1}$ $\frac{\Delta E\ corrected}{\Delta N\ corrected}$ + c



Elevation of traverse point

$H_2 = H_1 + HI_1 + VD_{12} - RH_2$

$H_3 = H_2 + HI_2 + VD_{23} - RH_3$

Find the calculated elevation for all points **then correct them.**

Submission:

1- Copy of Data
2- Full closed traverse calculation.
3- A3 drawing for traverse.